THE OVIPOSITION OF CONOPID FLIES UPON SMALLER ANDRENID BEES

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The following observations were made at Berkeley, California, in February, 1937 and 1938. A species of conopid fly, *Myopa rubida* Bigot, was seen to oviposit in several species of andrenid bees. In one instance an *Andrena complexa* Viereck was crowded from a blossom of *Ranunculus californicus* Benth. by one of these parasites which then followed directly behind the bee and seized it in flight at a distance of two or three yards from the flower. The fly grasped the bee's thorax and carried the bee in a straight line for about twenty feet, then released hold and flew away. At this point the fly was captured and ascertained to be a female. Since the bee escaped, the exact placement of the egg was not determined. The same procedure was observed nearby on a *Brassica campestris* Linn. blossom with an undescribed black *Andrena.*

The following year several conopids were found pursuing *Andrena* of different species around the branches of blooming *Salix* trees. In all cases the conopid followed the intricate flight path of its quarry before capturing it. An *Andrena pallidiscopa* Viereck was captured together with its parasite but examination revealed that oviposition had not yet been accomplished.

Published observations on the oviposition of conopids have generally been confined to that upon larger insects, such as *Bremus* and *Vespula*,[1] or *Bembix*.[2] The remarkable feature of the attack upon *Andrena* is the usual size discrepancy in favor of the parasite. The *Andrena complexa* observed was not more than half the size of its aggressor and a smaller but still noticeable size difference occurred between *Andrena pallidiscopa* Viereck and its parasite. The larvæ of these flies must find enough food in the abdomens of their adult hosts to complete development. Such a ratio of size of parasite to size of prey is exactly the opposite of the condition usually found in insects.

Three possible explanations of this condition are discussed below. First, there must be a very complete utilization of the abdominal contents of the bee. A dead *Andrena* containing a

[1] Meijere, V. C. 1903. Beitrag zur Kenntniss der Biologie und der Systematischen verwandtschaft der Conopiden. Tijdsch. voor Ent. 46:144-225.

[2] Bohart, G. E. and J. W. MacSwain. 1939. The life history of the sand wasp, *Bembix occidentalis beutenmuelleri* Fox and its parasites. Bull. South. Calif. Acad. Sci. 38:84-98.

conopid puparium has its greatly distended abdomen completely filled by the parasite. In addition, nectar taken by the bee is probably absorbed by the larva. This might even cause an increase in the appetite of the bee. Second, a conopid undergoes considerable expansion after emergence. This can be demonstrated by comparing the small, shriveled appearing pupa of *Myopa* taken from its puparium with a fully developed and expanded adult. Hence it seems logical to suppose that the parasite has a lower specific gravity than its host. Third, there is a great variation in the size of adult conopids of the same species. This may amount to a doubling in size of the largest example over that of the smallest. Inasmuch as these flies are not host specific, we may postulate that large specimens developed in large *Andrena* while small conopids developed in small host species, regardless of the size of their parents.

Winter Insect Collecting in Mexico

The results of two weeks' collecting by H. Welsh, Thurman Crawford and the authors in Mexico, starting December 23, 1940 indicated that at this season general insect collecting is very profitable in the more humid areas. Along the route covered from Laredo, Texas, to Mexico City and east to Vera Cruz, good collecting was encountered almost anywhere in the territory south of Valles and east of the Sierra Madre Orientale. On the mountain slopes and in the canyons, especially west of Tamuzunchale where the Pan-American highway ascends to the Mexican Plateau and in the Orizaba Valley near Cordoba, many plants were in bloom and conditions were ideal for all sorts of flying insects. In the lowland forests, night beating for leaf-feeding insects, sweeping for shade-dwelling Diptera, and pulling apart rotten wood for fungous feeders was usually successful.

In the semi-arid region north of Valles, which enjoys a wet season in the summer and early fall, conditions were too dry for most orders of insects. However, in spite of the lack of flowers and fresh vegetation, butterflies were very abundant in this area. Similarly, the high arid country of the Mexican Plateau and the upland coniferous forests bordering it were too dried out even though the weather was sufficiently warm for flying insects.

Since nights were cool everywhere, collecting by lantern was limited mainly to insects feeding or resting nearby.—G. E. Bohart and N. Stahler.